

PATENT ABSTRACTS OF JAPAN

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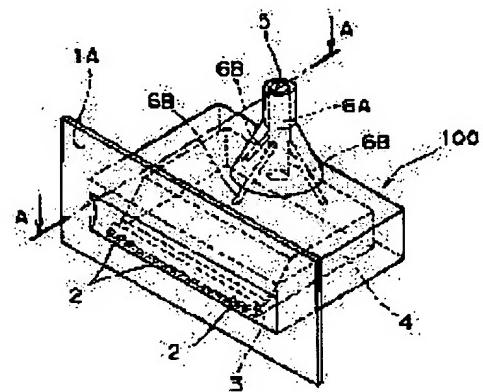
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(54) INK JET RECORDING HEAD

(57)Abstract:

PURPOSE: To prevent nondischarge and drops of ink and to ensure high quality recording without involving density irregularities by holding bubbles generated in a head in a properly-dispersed state in a common liquid chamber.

CONSTITUTION: In an ink jet recording head 100 where ink is supplied to a passage 3 through a common liquid chamber 4 from an ink supply port 5, ink is guided from the ink supply port 5 to the common liquid chamber 4 by multiple channels 6A, 6B.



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CLAIMS

[Claim(s)]

[Claim 1] The ink jet recording head characterized by said ink being led to a common liquid room by two or more passage from said ink feed hopper in the ink jet recording head which has two or more ink deliveries and liquid routes, and by which ink is supplied to this liquid route through a common liquid room from an ink feed hopper.

[Claim 2] It is the ink jet recording head according to claim 1 characterized by at least one differing in other passage and cross-sectional area among said two or more passage.

[Claim 3] The ink jet recording head according to claim 1 or 2 characterized by forming the crevice where the air bubbles in said ink can pile up in the wall surface of near as for which said passage of said common liquid room carries out opening.

[Claim 4] It is an ink jet recording head given in claim 1 characterized by being less than [hundreds times thru/or it of the cross section of said liquid route] except the passage where said cross section is the largest among said two or more passage thru/or one term of 3.

[Translation done.]

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DETAILED DESCRIPTION**[Detailed Description of the Invention]**

[0001]

[Industrial Application] Especially this invention has two or more ink deliveries and liquid routes for carrying out the regurgitation of the ink about an ink jet recording head, and relates to the ink jet recording head equipped with the ink feed hopper for supplying ink to the common liquid room which is open for free passage to these liquid routes.

[0002]

[Description of the Prior Art] Conventionally, according to a record signal, ink is breathed out from an ink delivery, and record is performed on a recorded material, and it consists of this kind of ink jet recording heads so that ink may take for breathing out and a common liquid room may be supplemented with ink through an ink feed hopper from an ink tank. By the way, originally, only one is prepared, but moreover, the ink passage and the ink feed hopper of the ink passage from an ink feed hopper to a common liquid room are also large to winds, such as 2000 times of the cross section of an ink delivery or a liquid route thru/or 3000 times, in order to make it the fluid resistance at the time of ink supply not become not much large, the number of such ink feed hoppers is one to a common liquid room, and they were formed.

[0003]

[Problem(s) to be Solved by the Invention] However, as mentioned above, since it is moreover formed sufficiently greatly as compared with the liquid route etc., when the aggregate of the large air bubbles in a common liquid room is made, it is easy for the number of the ink feed hopper and ink passage to be one, and to generate ink omission and the non-regurgitation according to generating of such the cellular aggregate in the conventional ink jet recording head. That is, in a common liquid room, it is easy to produce the large aggregate of air bubbles with the detailed air bubbles (printing bubble) generated in ink at the time of record, or the air bubbles (neglect bubble) generated in ink for long duration un-using it. If this becomes large too much, even if suction actuation will be performed through the ink delivery at the time of recovery action, it stops and drawing in and going out. Moreover, if suction by recovery action is performed by ink omission in the condition that there is no ink into a liquid route almost, it will be in the condition that air bubbles hardly exist in the common liquid interior of a room, and will become the cause of concentration unevenness generating by the cross talk for the oscillatory wave transmitted to a record working common liquid room.

[0004] The purpose of this invention is to offer the ink jet recording head high-definition record is guaranteed to be so that neither the ink non-regurgitation nor ink omission may be produced by making it make it pile up in the condition of having made it distributing suitably, all over a common liquid room, without growing greatly the air bubbles generated in ink paying attention to such a conventional problem, in order to aim at the solution.

[0005]

[Means for Solving the Problem] In order to attain this purpose, this invention has two or more ink deliveries and liquid routes, and is characterized by said ink being led to a common liquid room by two or more passage from said ink feed hopper in the ink jet recording head by which ink is supplied to this liquid route through a common liquid room from an ink feed hopper.

[0006]

[Function] According to this invention, since ink was made to be led by two or more passage from the ink feed hopper to the common liquid room, it prevents it being supplied in the form where ink is distributed by the common liquid room, and the air bubbles which float in ink by flow of the ink of the common liquid interior of a room produced as a result being subdivided, and becoming the non-regurgitation and ink omission. Moreover, by forming the crevice where air bubbles tend to pile up in the wall surface of the common liquid room as for which each passage carries out opening, air bubbles can be brought together in this part, it can be made to be able to pile up in it, and an oscillatory wave can be controlled in the form of a buffer. It contributes to the dissolution of the conventional inconvenient problem with supply

of stable ink by stopping the passage of the smaller one of it by hundreds times the liquid route cross section at most further again, while changing the cross section of two or more passage.

[0007]

[Example] Below, based on a drawing, the example of this invention is explained in detail and concretely.

[0008] Drawing 1 and drawing 2 are the explanatory views showing the 1st example of this invention, the appearance perspective view of the ink jet recording head 100 according [drawing 1] to this invention and drawing 2 are the decomposition perspective views showing the configuration of the ink discharge part 2000 of said recording head 100, and, for a wiring substrate and 2300, as for a pressure spring and 2600, a base plate and 2500 are [2200 / an electrode holder and 2700] filters.

[0009] Drawing 3 and drawing 4 are the explanatory views which explain the ink supply way of this invention to a detail, and the appearance perspective view of the top plate with which drawing 3 has an ink supply way, and drawing 4 are the core sectional views of this top plate.

[0010] In these drawings, it is a top plate with the ink supply way according [1] to this invention, the ink delivery where 2 was drilled in the ink regurgitation side 1A, and the liquid route where 3 leads ink to an ink delivery from the common liquid room 4, and is prepared in each liquid route 3, the component (heater board 2100), for example, the electric thermal-conversion object, for generating the energy which carries out the regurgitation of the ink. An ink feed hopper for 5 to supply ink to the common liquid room 4 from the ink tank section 1000, and 6A and 6B are ink passage which leads supply ink to the common liquid room 4 from the ink feed hopper 5. In addition, the main ink passage to which ink passage 6A connects directly the ink feed hopper 5 and the common liquid room 4, and 6B are two or more subink passage formed in the form distributed from the middle of main ink passage 6A to a radial towards the formation direction side of an ink delivery train, and the ink delivery 2 side.

[0011] In addition, the diameter and the cross section of main ink passage 6A are greatly formed here compared with it of subink passage 6B. Moreover, in order to make easy to lead to ***** 7 the air bubbles which provide ***** 7 in head lining of the common liquid room 4 as a crevice for making air bubbles pile up near the opening of main ink passage 6A and subink passage 6B as shown in drawing 4, and were generated in the ink in a liquid route 3 or the common liquid room 4, the wall 8 of the common liquid room 4 which stands in a row in a liquid route 3 is made to have inclined towards ***** 7. The air bubbles which carried out 9A in this way, and were caught by ***** 7, and 9B are the other air bubbles which float the inside of the common liquid room 4, and such suspension air-bubbles 9B can be discharged through a liquid route 3 and the ink delivery 2 at the time of suction recovery action.

[0012] That is, although such suspension air-bubbles 9B is almost subdivided by flow of the ink supplied to the common liquid room 4 through two or more passage and it is caught by ***** 7, what still remains all over the common liquid room 4 is discharged by the suction recovery action generally performed with a power up or a predetermined time interval, and does not grow to the large air bubbles like [it becomes ink omission]. Moreover, since opening is carried out out of ink passage 6A in the form which ink passage 6B distributed on the head lining of the common liquid room 4, it will act in the form where the negative pressure applied to ink at the time of suction is also distributed, and the air bubbles which said that no air bubbles will be discharged and were caught by ***** 7 remain irrespective of suction actuation.

[0013] While ink is uniformly supplied to the common liquid room 4 by the ink passage 6A and 6B arranged in the distributed form further again, a flow of the ink in the common liquid room 4 becomes active, it generates conventionally at a common liquid room at the time of the drive of a recording head, generating of the oscillatory wave which was a victory is controlled, and it can prevent that concentration unevenness arises.

[0014] Drawing 5 shows the 2nd example of this invention. This example is that in which space formed as ***** the tooth-form slot 10 to which the direction of a right angle is parallel at the inclination wall 8 by the configuration shown in drawing 4 as the 1st example, can catch some air bubbles which are going to be attracted by these tooth-form ***** 10 in the direction of arrow-head A at the time of suction recovery action, and can make it pile up. In addition, if in charge of shaping of such a recording head 100, metal mold (un-illustrating) is divided into 3 thru/or four pieces in the vertical direction in this drawing, and it was made to carry out mold omission separately in the upper and lower sides or the direction of slant. Thus, while making some air bubbles pile up in tooth-form ***** 10 like the 1st example also in the constituted recording head 100, suction discharge of the next air bubbles could be carried out at the time of suction recovery, and record of high definition without concentration unevenness was acquired.

[0015] Drawing 6 shows the 3rd example of this invention. In addition, drawing 6 looks at and shows the recording head 100 by the same this example that basic form voice showed drawing 3 from the ink regurgitation side 1A side. The place by which it is characterized [of this example] carries out opening of the subink passage 6B to that head lining made to incline smoothly at the same time it changes to both wings from the center section where head lining of the

common liquid room 4 is prepared in the ink feed hopper 5 and main ink passage 6A and gives inclination aslant , and it is in the point which distributed ***** 7 into this inclination part further.

[0016] Moreover, drawing 7 shows the 4th example of this invention, this example is that which subink passage 6B is brought [that] near by the pan of the common liquid room 4 near the both wings, and was made to carry out opening to it to the 3rd example, and although ***** is not prepared in this drawing, it cannot be overemphasized that it can learn from drawing 6 and ***** can be distributed on the head lining of the common liquid room 4.

[0017] In addition, although it was in the example described above about the case where each prepares two subink passage of details out of the main ink passage of eye **, the number of these ink passage may be what kind of combination, as long as it is chosen within limits which it is not restricted to a total of three, and the cross section of each of that passage does not become large too much, either, and are mentioned mostly later. However, although the record result without concentration unevenness was obtained when the number of passage was made into a total of 3 thru/or 6, as for such passage, being distributed as equally as possible is desirable.

[0018] Furthermore, this invention person etc. recorded using the ink jet recording head constituted from combination which shows the number and each passage cross-sectional area (diameter at the time of perfect circle conversion (mm)) of ink passage in the following table 1.

[0019]

[Table 1]

パターン	流路の数(本)	真円換算時直径(mm)					
		1.2	0.8	0.4			
A	3	1.2	0.8	0.4			
B	4	1.0	0.6	0.6	0.5		
C	5	0.9	0.8	0.7	0.6	0.5	
D	6	1.5	1.2	1.0	0.9	0.8	0.7

[0020] Consequently, although the record concentration unevenness can be controlled as compared with the former also in [whose] the configuration by which combination was acquired, the sequence in which the concentration unevenness was not conspicuous especially was C>D>B>A.

[0021]

[Effect of the Invention] In the ink jet recording head which has two or more ink deliveries and liquid routes and by which ink is supplied to this liquid route through a common liquid room from an ink feed hopper according to this invention as explained above Since said ink was made to be led by two or more passage from said ink feed hopper to the common liquid room While being able to prevent controlling until now being able to limit difficult magnitude and amount of air bubbles of the common liquid interior of a room to the suitable range, and air bubbles becoming large too much, and generating the non-regurgitation and ink omission Cross talk generating for the oscillatory wave by there being no air bubbles can be controlled, and very little stable record of concentration unevenness came to be acquired.

[Translation done.]

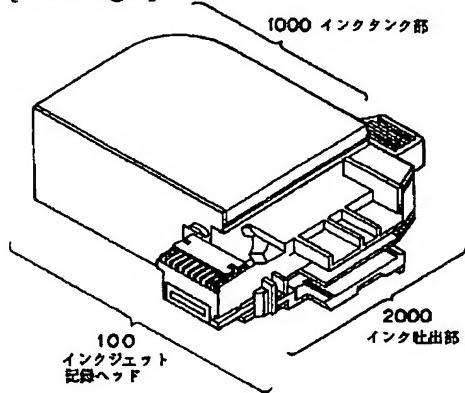
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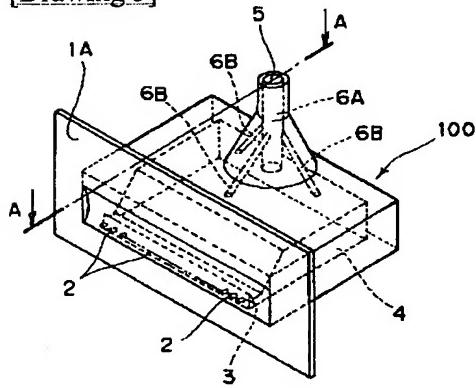
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DRAWINGS

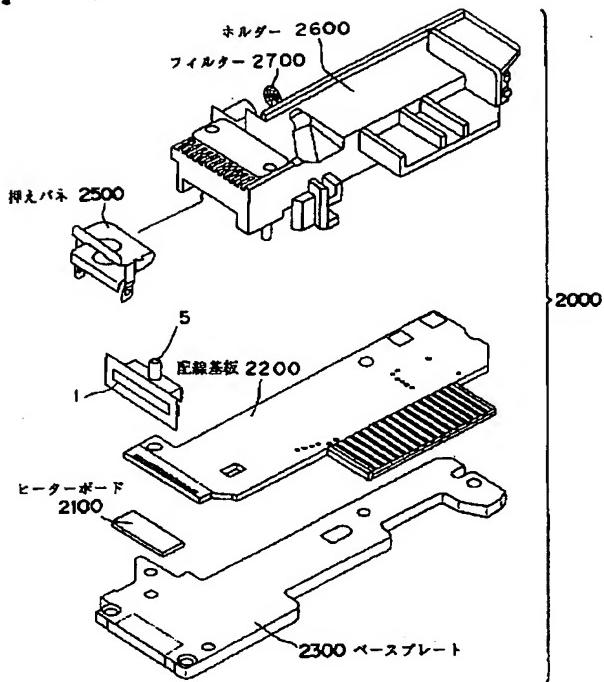
[Drawing 1]



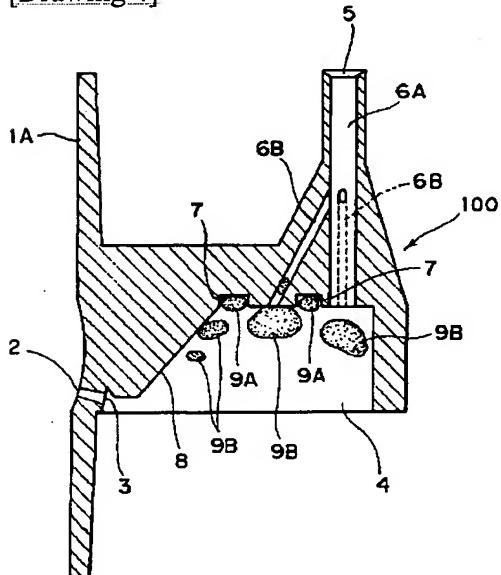
[Drawing 3]



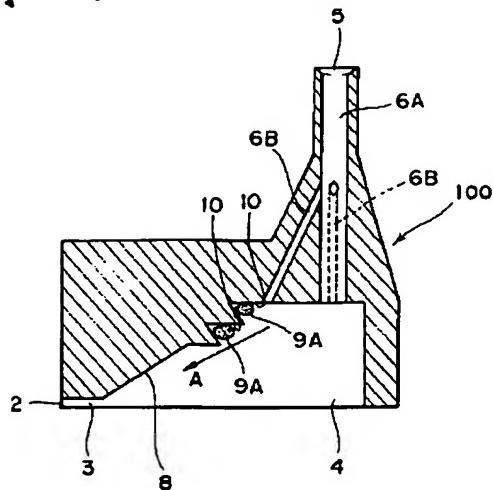
[Drawing 2]



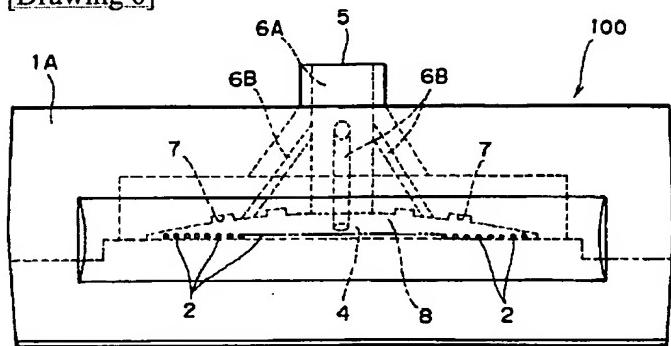
[Drawing 4]



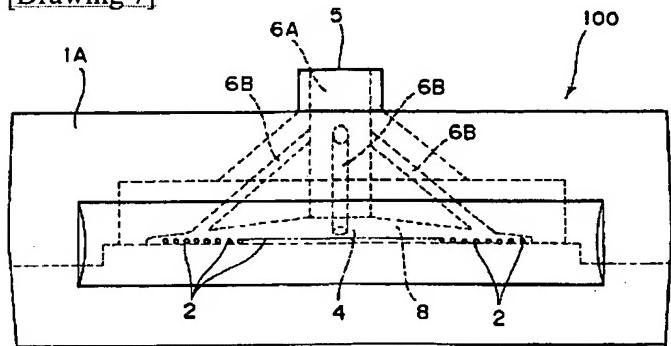
[Drawing 5]



[Drawing 6]



[Drawing 7]



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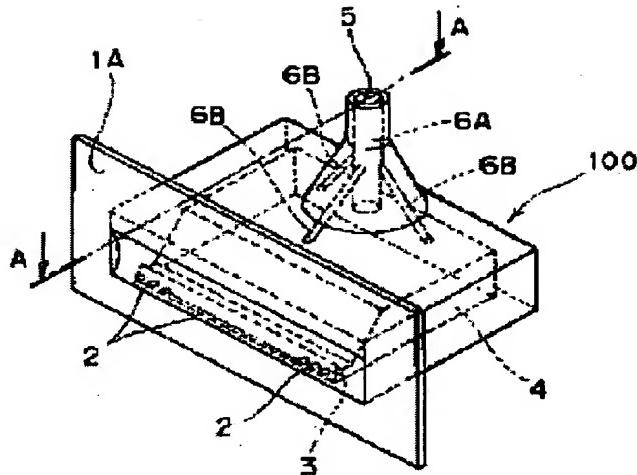
INK JET RECORDING HEAD

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Inventor: OKAZAKI TAKESHI; others: 02
Applicant: CANON INC
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Abstract of JP7117232

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CONSTITUTION: In an ink jet recording head 100 where ink is supplied to a passage 3 through a common liquid chamber 4 from an ink supply port 5, ink is guided from the ink supply port 5 to the common liquid chamber 4 by multiple channels 6A, 6B.



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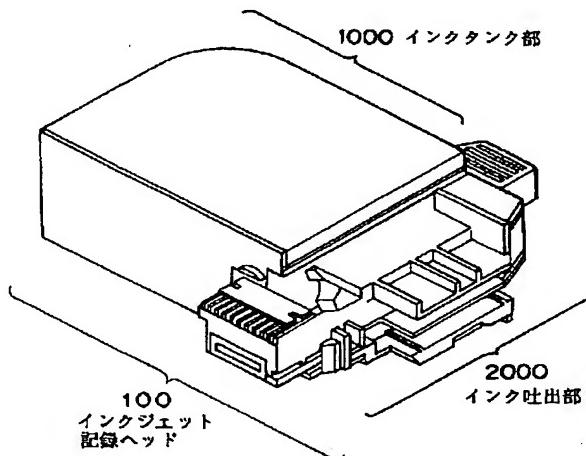
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(54)【発明の名称】 インクジェット記録ヘッド

(57)【要約】

【目的】 ヘッド内のインク中に発生する気泡を共通液室において適宜分散させた状態で保留させるようすることによって、インク不吐出やインク落ちを防止し、濃度むらのない高品位の記録が保証されるインクジェット記録ヘッド。

【構成】 インク供給口(5)から共通液室(4)を介して液路(3)にインクが供給されるインクジェット記録ヘッド(100)において、複数の流路(6A, 6B)によりインク供給口(5)からインクが共通液室(4)に導かれるようにしたインクジェット記録ヘッド(100)。



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【特許請求の範囲】

【請求項1】複数のインク吐出口および液路を有し、該液路にインク供給口から共通液室を介してインクが供給されるインクジェット記録ヘッドにおいて、前記インクが複数の流路により前記インク供給口から共通液室に導かれるようにしたことを特徴とするインクジェット記録ヘッド。

【請求項2】前記複数の流路のうち少なくとも1つは他の流路と断面積が異なることを特徴とする請求項1に記載のインクジェット記録ヘッド。

【請求項3】前記共通液室の前記流路が開口する近傍の壁面に前記インク中の気泡が滞留可能な凹部を形成したことを特徴とする請求項1または2に記載のインクジェット記録ヘッド。

【請求項4】前記複数の流路のうち、最も前記断面積の大きい流路以外は、前記液路の断面積の数百倍ないしそれ以下であることを特徴とする請求項1ないし3のいずれかの項に記載のインクジェット記録ヘッド。

【発明の詳細な説明】

【0001】

【産業上の利用分野】本発明は、インクジェット記録ヘッドに関し、特にインクを吐出するための複数のインク吐出口および液路を有し、これらの液路に連通する共通液室にインクを供給するためのインク供給口を具えたインクジェット記録ヘッドに関する。

【0002】

【従来の技術】従来、この種のインクジェット記録ヘッドでは記録信号に応じてインク吐出口からインクが吐出され、被記録材上に記録が行われ、インクが吐出されるに連れてインクタンクからインク供給口を介して共通液室にインクが補充されるように構成されている。ところで、このようなインク供給口は本来、共通液室に対して1つであり、また、インク供給口から共通液室へのインク流路も1つしか設けられておらず、しかもそのインク流路およびインク供給口もインク供給時の流体抵抗が余り大きくならないようにするためにインク吐出口や液路の断面積の例えは2千倍ないし3千倍といった風に大きく形成されていた。

【0003】

【発明が解決しようとする課題】しかしながら、上述のように従来のインクジェット記録ヘッドでは、そのインク供給口およびインク流路が1つで、しかも液路等に比較して十分大きく形成されているために、共通液室に大きい気泡の集合体ができた場合、このような気泡集合体の発生によりインク落ちや不吐出が発生し易い。すなわち、記録時インク中に発生する微細な気泡（印字泡）や長時間不使用のためにインク中に発生する気泡（放置泡）によって共通液室には気泡の大きい集合体が生じ易い。そして、これが大きくなり過ぎると回復動作時にそのインク吐出口を介して吸引動作が行われても吸引し切

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れなくなる。また、インク落ちによって液路内にインクが大方無い状態で回復動作による吸引が行われると、共通液室内に気泡がほとんど存在しない状態となり、記録動作中共通液室に伝達される振動波のためにクロストークによる濃度むら発生の原因となる。

【0004】本発明の目的は、このような従来の問題に着目し、その解決を図るべく、インク中に発生する気泡を大きく生長させることなく共通液室中に適宜分散させた状態で滞留させるようにすることでインク不吐出やインク落ちを生じるようなことがなく、高品位の記録が保証されるインクジェット記録ヘッドを提供することにある。

【0005】

【課題を解決するための手段】かかる目的を達成するために、本発明は、複数のインク吐出口および液路を有し、該液路にインク供給口から共通液室を介してインクが供給されるインクジェット記録ヘッドにおいて、前記インクが複数の流路により前記インク供給口から共通液室に導かれるようにしたことを特徴とするものである。

【0006】

【作用】本発明によれば、インク供給口から複数の流路によってインクが共通液室に導かれるようにしたので、インクが共通液室に分散される形で供給され、その結果生じる、共通液室内のインクの流動によりインク中に浮遊する気泡が細分化されて不吐出やインク落ちとなるのを防止する。また、各流路が開口する共通液室の壁面に気泡が滞留し易い凹部を形成することにより、この部分に気泡を集めて滞留させることができ、振動波を緩衝の形で抑制することができる。さらにまた、複数の流路の断面積を異ならせると共にその小さい方の流路をせいぜい液路断面積の数百倍にとどめることで、安定したインクの供給と共に従来の不都合な問題の解消に貢献する。

【0007】

【実施例】以下に、図面に基づいて本発明の実施例を詳細かつ具体的に説明する。

【0008】図1、図2は、本発明の第1実施例を示す説明図で、図1は本発明によるインクジェット記録ヘッド100の外観斜視図、図2は前記記録ヘッド100のインク吐出部2000の構成を示す分解斜視図であり、40 2200は配線基板、2300はベースプレート、2500は押さえね、2600はホルダー、2700はフィルタである。

【0009】図3、図4は、本発明のインク供給路を詳細に説明する説明図で、図3はインク供給路を有する天板の外観斜視図、図4は該天板の中心部断面図である。

【0010】これらの図において、1は本発明によるインク供給路を有した天板、2はそのインク吐出面1Aに穿設されたインク吐出口、3は共通液室4からインクをインク吐出口に導く液路であり、各液路3にはインクを吐出するエネルギーを発生するための素子、例えば電気

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熱変換体（ヒーターボード2100）が設けられている。5はインクタンク部1000から共通液室4にインクを供給するためのインク供給口、6Aおよび6Bはインク供給口5から共通液室4に供給インクを導くインク流路である。なお、インク流路6Aはインク供給口5と共通液室4とを直接に結ぶ主インク流路、6Bは主インク流路6Aの途中からインク吐出口列の形成方向およびインク吐出口2の側に向けて放射状に分散する形で形成した複数の副インク流路である。

【0011】なおここで、主インク流路6Aの直径および断面積は副インク流路6Bのそれに比べて大きく形成されている。また、共通液室4の天井には図4に示すように主インク流路6Aおよび副インク流路6Bの開口部近傍に気泡を滞留させるための凹部として泡溜り7が設けてあり、また、液路3や共通液室4内のインク中に発生した気泡を泡溜り7に導き易くするために液路3に連なる共通液室4の壁8は泡溜り7に向けて傾斜させてある。9Aはこのようにして泡溜り7に捕捉された気泡、9Bは共通液室4中を浮遊するそれ以外の気泡であり、このような浮遊気泡9Bは吸引回復動作時に液路3およびインク吐出口2を介して排出可能なものである。

【0012】すなわち、このような浮遊気泡9Bは大方、共通液室4に複数の流路を介して供給されてくるインクの流動により細分化され、泡溜り7に捕捉されるが、それでも共通液室4中に残留するようなものは一般的に電源投入時や所定の時間間隔で行われる吸引回復動作によって排出され、インク落ちとなるほど大きい気泡には生長しない。また、インク流路6Aの外にインク流路6Bが共通液室4の天井に分散した形で開口しているので、吸引時にインクにかかる負圧も分散される形で作用することになり、全ての気泡が排出されてしまうということがなく、泡溜り7に捕捉された気泡は吸引動作にかかわらず残る。

【0013】さらにまた、分散された形で配設されたインク流路6A、6Bにより共通液室4に万遍なくインクが供給されると共に、共通液室4内のインクの流動が活発となり、記録ヘッドの駆動時に従来、共通液室で発生し勝ちであった振動波の発生が抑制され、濃度むらが生じるのを防止することができる。

【0014】図5は本発明の第2実施例を示す。本例は、第1実施例として図4に示した構成による傾斜壁8に紙面とは直角方向の平行する歯型溝10を泡溜りとし

て形成したもので、これらの歯型泡溜り溝10により吸引回復動作時に矢印A方向に吸引されようとする気泡の一部を捕捉し、滞留させることができる。なお、このような記録ヘッド100の成形にあたっては、金型（不図示）をこの図で上下方向に3ないし4個に分割し、個々に上下もしくは斜め方向に型抜きするようにした。このように構成した記録ヘッド100においても第1実施例と同様歯型泡溜り溝10に一部の気泡を滞留させると共にあとの気泡を吸引回復時に吸引排出することができ、濃度むらのない高品位の記録が得られた。

【0015】図6は本発明の第3の実施例を示す。なお、図6は基本形態が図3に示したと同様な本実施例による記録ヘッド100をインク吐出面1A側から見て示す。本例の特徴とするところは、共通液室4の天井をインク供給口5および主インク流路6Aが設けられる中央部から両翼にかけて斜めに勾配を持たせると同時にその滑らかに傾斜させた天井に副インク流路6Bを開口させ、さらにこの傾斜部分に泡溜り7を分散配置した点にある。

【0016】また、図7は本発明の第4の実施例を示し、本例は、第3の実施例に対し副インク流路6Bを共通液室4のさらに両翼近傍によせて開口させるようにしたもので、この図では泡溜りが設けられていないが図6にならって共通液室4の天井に泡溜りを分散配置することができることはいうまでもない。

【0017】なお、以上に述べてきた実施例では、いずれも太目の主インク流路の外に細目の副インク流路を2本設けた場合についてであったが、かかるインク流路の数は合計3本に限られるものではなく、また、その各流路の断面積も大きくなり過ぎず、ほぼ後述するような範囲内において選択される限り、どのような組合せであってもよい。ただし、流路の数は合計3本ないし6本としたときに最も濃度むらの無い記録結果が得られたが、これらの流路はなるべく均等に分散配置されることが望ましい。

【0018】さらに本発明者等はインク流路の本数とそれぞれの流路断面積（真円換算時の直径（mm））とを以下の表1に示す組合せて構成したインクジェット記録ヘッドを用いて記録を行った。

40 【0019】

【表1】

パターン	流路の数(本)	真円換算時直径(mm)						
		1.2	0.8	0.4				
A	3	1.2	0.8	0.4				
B	4	1.0	0.6	0.5	0.5			
C	5	0.9	0.8	0.7	0.6	0.5		
D	6	1.5	1.2	1.0	0.9	0.8	0.7	

【0020】その結果、いずれの組合せによる構成の場合も従来に比して濃度むらを抑制することができる記録が得られたが、中でもその濃度むらが目立たなかった順序は、

C>D>B>A

であった。

【0021】

【発明の効果】以上説明してきたように、本発明によれば、複数のインク吐出口および液路を有し、該液路にインク供給口から共通液室を介してインクが供給されるインクジェット記録ヘッドにおいて、前記インクが複数の流路により前記インク供給口から共通液室に導かれるようにして、これまでには制御することが困難であった共通液室内の気泡の大きさや量を適切な範囲に限定することができ、気泡が大きくなり過ぎて不吐出やインク落ちを発生することを防止することができると共に、気泡が無いことによる振動波のためのクロストーク発生を抑制することができて、濃度むらの極めて少ない安定した記録が得られるようになった。

【図面の簡単な説明】

【図1】本発明によるインクジェット記録ヘッドの構成の一例を示す外観斜視図である。

【図2】図1に示す記録ヘッドのインク吐出部の分解斜*

* 視図である。

【図3】本発明の第1実施例による構成を透視して示す斜視図である。

【図4】図3のA-A線断面図である。

【図5】本発明の第2実施例による構成を示す断面図である。

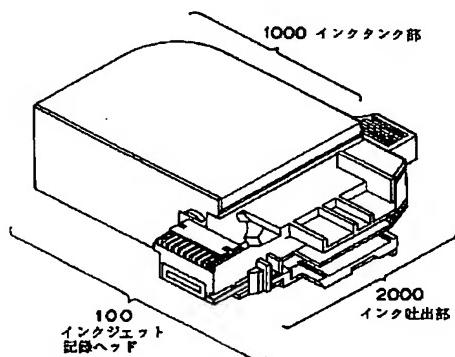
【図6】本発明の第3実施例による構成を透視して示す正面図である。

【図7】本発明の第4実施例による構成を透視して示す正面図である。

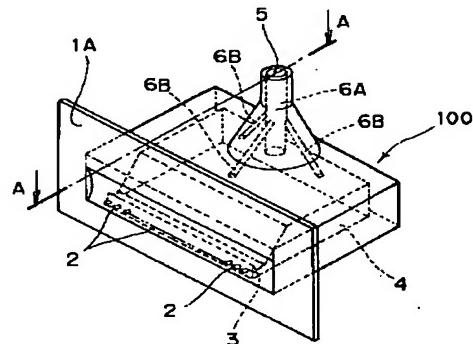
【符号の説明】

- 1 天板
- 1 A インク吐出面
- 2 インク吐出口
- 3 液路
- 4 共通液室
- 5 インク供給口
- 6 A, 6 B インク流路
- 7 泡溜り
- 8 壁(傾斜壁)
- 9 A, 9 B 気泡
- 10 歯型(泡溜り)溝
- 100 記録ヘッド

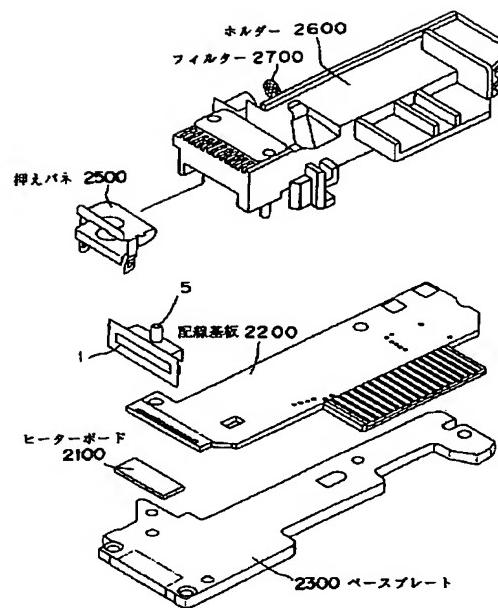
【図1】



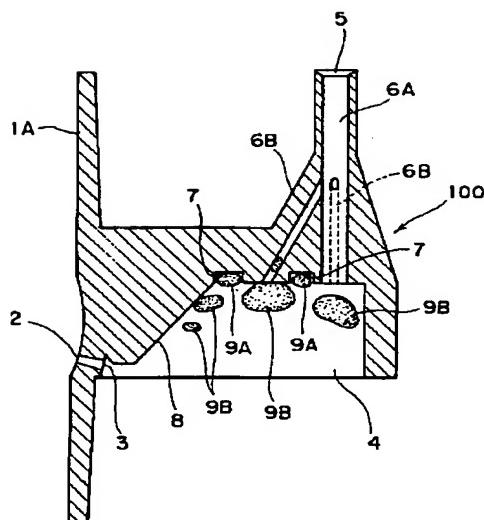
【図3】



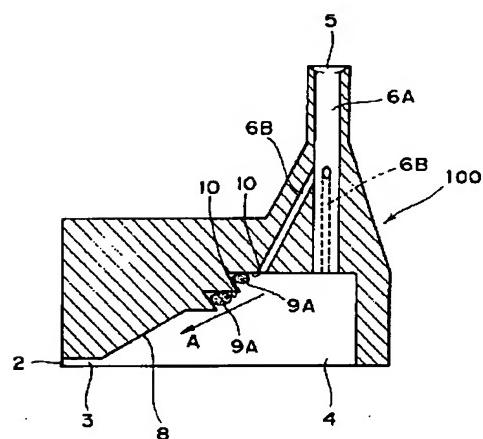
【図2】



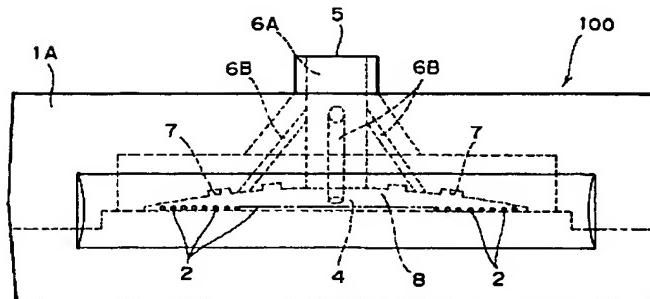
【図4】



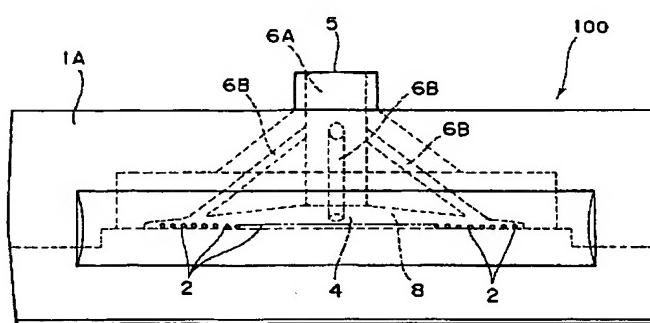
【図5】



【図6】



【図7】



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